T04D08 – HL Bonding Quiz MS

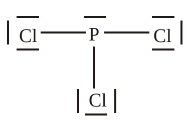
1. A **(3)**
2. C **(4)**
3. D **(6)**
4. D **(5)**
5. B **(4)**
6. C **(5)**
7. B **(5)**
8. D **(5)**
9. A **(4)**
10. D **(5)**
11. C **(7)**
12. C **(7)**
13. C **(5)**
14. C **(6)**
15. A **(7)**
16. C **(7)**

IB Chem HL1			**Free Response Section (Paper 02)**													
Level:	MC	FR	**Grade**	**Possible**	**3**		**4**		**5**		**6**		**7**		**Cutoff**	
Above +6	0%	0%	**2**	0	50%	0	40%	0.8	30%	4.8	20%	0.8	10%	0.6	**7**	
Above +5	10%	10%	**3**	0	80%	0	50%	1	40%	6.4	30%	1.2	20%	1.2	**10**	
Above +4	20%	20%	**4**	2	90%	0	80%	1.6	50%	8	40%	1.6	30%	1.8	**13**	BELOW
Above +3	35%	30%	**5**	16	95%	0	90%	1.8	80%	12.8	50%	2	40%	2.4	**19**	STANDARD
Above +2	45%	40%	**6**	4	100%	0	95%	1.9	90%	14.4	80%	3.2	50%	3	**23**	ABOVE
Above +1	55%	50%	**7**	6	100%	0	100%	2	95%	15.2	90%	3.6	80%	4.8	**26**	
Level	**80%**	**80%**	**Multiple Choice Section (Paper 01)**													
Below -1	90%	90%	**Grade**	**Possible**	**3**		**4**		**5**		**6**		**7**		**Cutoff**	
Below -2	95%	95%	**2**	0	55%	0.6	45%	1.35	35%	2.1	20%	0.4	10%	0.4	**5**	
Below -3	100%	100%	**3**	1	80%	0.8	55%	1.65	45%	2.7	35%	0.7	20%	0.8	**7**	
Below -4	100%	100%	**4**	3	90%	0.9	80%	2.4	55%	3.3	45%	0.9	35%	1.4	**9**	BELOW
Below -5	100%	100%	**5**	6	95%	1	90%	2.7	80%	4.8	55%	1.1	45%	1.8	**11**	STANDARD
Below -6	100%	100%	**6**	2	100%	1	95%	2.85	90%	5.4	80%	1.6	55%	2.2	**13**	ABOVE
Below -7	100%	100%	**7**	4	100%	1	100%	3	95%	5.7	90%	1.8	80%	3.2	**15**	

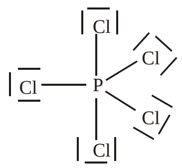
17. (i) **(5x1)(6x1)(7x1)**

*Award **[1]** for each correct Lewis structure.*

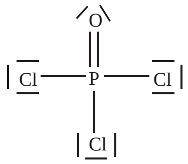
PCl_3

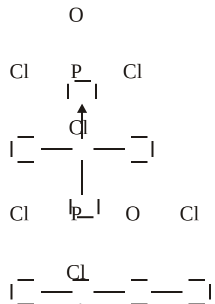


PCl_5



$POCl_3$





3

Accept use of dots or crosses to represent electron pairs.
*Subtract **[1]** if non-bonding pair on P in PCl_3 is missing. Subtract **[1]** if non-bonding pair(s) on Cl or O are missing.*
Accept legitimate alternatives for $POCl_3$, e.g. see below.

(ii) **(5x6)**

PCl_3	PCl_5	$POCl_3$
trigonal pyramid;	trigonal bipyramid;	tetrahedral;
Accept answers in range 100° to 108°;	90° **and** 120°;	*Accept answers in range* 100° to 112°;

Allow ECF if based on legitimate chemical structure. 6

(iii) **(5x3)**

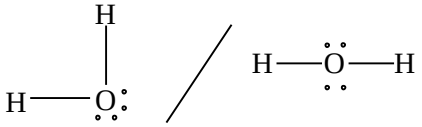
PCl_3	PCl_5	$POCl_3$
polar, polarities do not cancel/OWTTE;	non-polar, polarities cancel/OWTTE;	polar, polarities do not cancel/OWTTE;

3

*Award **[2]** for three polarities correct, **[1]** for two polarities correct, and **[1]** for correct reason(s).*
Accept argument based on dipole moments.
Allow ECF if based on legitimate chemical structure.

[12]

18. **(5x1)**



Allow a combination of dots, crosses or lines.

(4x1)bent/V shaped/angular

(4x1)104.5°;

Accept answers in range 104° to 106°.

(6x1)repulsion of the two non-bonding pairs of electrons forces bond angle to be smaller/non-bonding pairs repel more than bonding pairs; 4

[4]

19. (a) **(5x1)**hybridization: mixing/merging of atomic orbitals;

(7x1)N_2 - sp;

(7x1)N_2H_2 - sp^2;

(7x1)N_2H_4 - sp^3; 4

(b) **(7x1)**σ bonds (result from the) overlapping of orbitals end to end/along inter-nuclear axis;

(7x1)π bonds (result from the) overlapping of parallel/sideways p orbitals;

(6x1) (single bonds) σ bonds only;

(6x1) (double bonds) have a σ bond and a π bond; 4

Suitable clear and labeled diagrams acceptable for all marks.

[8]

20. *Electrical conductivity:*

(5x1) Bonding electrons are delocalized;

(5x1) Current flow occurs without displacement of atoms within the metal/ able to flow within the metal;

Malleability:

(5x1) Can be hammered into thin sheets;

(5x1)atoms capable of slipping with respect to one another; 4

[4]